भारतीय मानक
Indian Standard

IS 11356 : 2020

स्टाइरीन-बुटाडाइन रबड़ लैटेक्स — विशिष्टि

(पहला पुनरीक्षण)

Styrene-Butadiene Rubber Latex — Specification

(First Revision)

ICS 83.040.10

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भारतीय मानक ब्यूरो
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January 2020 **Price Group 5**

Rubber and Rubber Products Sectional Committee, PCD 13

FORWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Rubber and Rubber Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

The type of latex covered in this standard corresponds to the commercially known S-2000 latex. This number is allotted by the International Institute of Synthetic Rubber Producers Inc., USA.

Styrene-butadiene latex (CAS No. 9003-55-8) is used for tyre cord dipping, compounding adhesives for footwear and paper industry, carpet backings, upholstery and linings for proofed goods like firefighting hoses, etc.

This standard was originally published in 1985 and being revised to mainly update cross referred standards.

The composition of the Committee, responsible for the formulation of this standard is given at Annex E.

For the purpose of deciding whether a particular requirement this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be that same as the specified value in this standard.

Indian Standard

STYRENE-BUTADIENE RUBBER LATEX — SPECIFICATION

(First Revision)

1 SCOPE

This standard prescribes the requirements and methods of sampling and test for styrene-butadiene rubber latex.

2 REFERENCES

The following Indian Standards contain provisions which through reference in this text constitute the provisions of the standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
1070 : 1992	Reagent grade water — Specification (*third revision*)
3660 (Part 1) : 1999	Methods of test for natural rubber: Part 1 Determination of dirt [NR : 1] (*third revision*)
4511 (Part 1) : 1986	Methods of test for styrene-butadiene rubber (SBR) latices: Part 1 Determination of dry polymer content SBRL : 1 (*first revision*)
4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
9316 (Part 1) : 1987	Methods of test for rubber latex: Part 1 Determination of surface tension (RL : 1) (*first revision*)
9316 (Part 2) : 1987	Methods of test for rubber latex: Part 2 Determination of viscosity (RL : 2) (*first revision*)
9316 (Part 3) : 1987	Methods of test for rubber latex: Part 3 Determination of coagulum content (sieve residue) (RL:3) (*first revision*)
9316 (Part 4) : 1988	Methods of test for rubber latex: Part 4 Determination of total solids content RL : 4 (*first revision*)
9316 (Part 5) : 2013/ ISO 123 : 2001	Methods of test for rubber latex: Part 5 Drawing of samples [RL : 5] (*second revision*)
9316 (Part 6) : 2017/ ISO 976 : 2013	Methods of test for rubber latex: Part 6 Determination of *p*H [RL : 6] (*second revision*)

3 REQUIREMENTS

3.1 This standard covers hot polymerized styrene-butadiene type copolymer latex which is non-staining and emulsified with rosin acid soap emulsifier.

3.2 The material shall comply with the requirements given in Table 1 and Annex A, B, and C of this standard. Reference to the relevant methods are given in co1umn 5 and 6 of Table 1.

4 PACKING AND MARKING

4.1 Packing

The latex shall be packed in epoxy coated mild steel drums or as agreed to between the purchaser and the supplier.

4.2 Marking

4.2.1 The containers shall be marked with the following:

a) Name of the manufacturer or’ trade-mark, if any;
b) Net and gross mass in kg; and
c) Month and year of packing.

4.2.2 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and

Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.’

5 SCALES OF SAMPLING AND CRITERIA FOR CONFORMITY

The method of drawing representative samples of the material and criteria for conformity shall be as prescribed in Annex D.

Table 1 Requirements for Styrene-Butadiene Rubber Latex

(*Clause* 3.2)

Sl No.	Characteristic	Requirements		Method of Test Ref to	
		Min	*Max*	Annex	IS:
(1)	(2)	(3)	(4)	(5)	(6)
i)	Total solids content, percent by mass	40	44	—	IS 9316 (Part 4)
ii)	Residual styrene, percent by mass	—	0.10	—	IS 4511 (Part 1)
iii)	*p*H	10.5	11.5	—	IS 9316 (Part 6)
iv)	Mooney viscosity ML_1+_4 at 100 ºC	60	90	A	—
v)	Bound styrene, percent by mass	44	48	—	IS 4511 (Part 1)
vi)	Surface tension, mN/ m	47	55	—	IS 9316 (Part 1)
vii)	Relative density at 27/27°C	—	0.99	—	IS 4511 (Part 1)
viii)	Average particle size	800°A	1 200°A	B	—
ix)	Coagulum content, percent by mass of total solids	—	0.1	—	IS 9316 (Part 3)
x)	Mechanical stability, coagulum percent by mass	—	0.1	C	—

ANNEX A

[*Table* 1, *Sl No.* (iv)]

DETERMINATION OF MOONEY VISCOSITY

A-1 OUTLINE OF THE METHOD

The rubber portion of a latex is separated by a salt-acid methanol coagulation, dried and massed on a mill. The viscosity of the rubber is measured on a Mooney viscometer.

A-2 APPARATUS

A-2.1 High Speed Agitator, waring blender or similar blender.

A-2.2 Drying Trays, 30 × 20 × 2.5 cm with coarse screen bottom.

A-2.3 Draft Oven, capable of maintaining 120 ± 5°C.

A-2.4 Laboratory Mill

A-2.5 Mooney Machine, with large rotor.

A-3 REAGENTS

A-3.1 Sulphuric Acid, 18 percent (*v/v*).

A-3.2 Sodium Chloride Solution, 10 percent (m/v).

A-3.3 Phenyl Beta Nephthylamine Solution, 0.75 percent (*m/v*) phenyl beta naphthylamine solution in methanol.

A-4 PROCEDURE

A-4.1 Dilute the total solids content of the latex with distilled water to approximately 30 percent. Add to 250 ml of the diluted latex, 50 ml of the 10 percent sodium chloride solution and mix thoroughly. Stir the creamed latex in a waring blender and add 250 ml of phenyl beta naphthylamine solution in 50 to 60 s. Continue agitation for 2 to 3 min. During this period slowly add 10 ml of 18 percent sulphuric acid. If the coagulating solution does not turn Congo red paper from red to blue, add additional sulphuric acid while stirring until the colour does change.

A-4.2 Pour the contents in the coagulating cup on cheese cloth and allow the mass to drain. Press as much serum as possible from the mass. Pull the mass apart, wash thoroughly, till free of acid and transfer the pieces to a drying tray. Keep it for about an hour before determining the Mooney viscosity.

Dry the crumb in a draft oven at 120 ± 5°C for approximately 45 min. Mill mass the rubber and determine between 10 to 30 min Mooney viscosity as given in IS 3660 (Part 1).

ANNEX B

[*Table* 1, *Sl No.* (viii)]

DETERMINATION OF PARTICLE SIZE OF LATEX

B-1 OUTLINE OF THE METHOD

Particle size of latex is determined by turbidity measurements in the visible region in a UV-visible spectrophotometer. Turbidity of latex is proportional to the particle size in the absorption range of 0.07 to 0.1 at 700 nm.

B-2 APPARATUS

a) UV-visible spectrophotometer;
b) 80 ASTM mesh screen;
c) 100 ml volumetric flasks; and
d) Balance.

B-3 PROCEDURE

Strain latex through 80 mesh stainless screen and determine total solids content. Weigh accurately about 1 g (± 0.002 g) of latex into a clean dry l00 ml volumetric flask. Immediately add approximately 30 ml of distilled water to the latex sample to prevent formation of agglomerates or skin on latex during its brief exposure to air. Dilute to the mark with distilled water and mix thoroughly. Pipette 5 ml aliquot of the above latex solution into another clean 100 ml volumetric flask and dilute to make with distilled water. Stopper the flask and mix thoroughly.

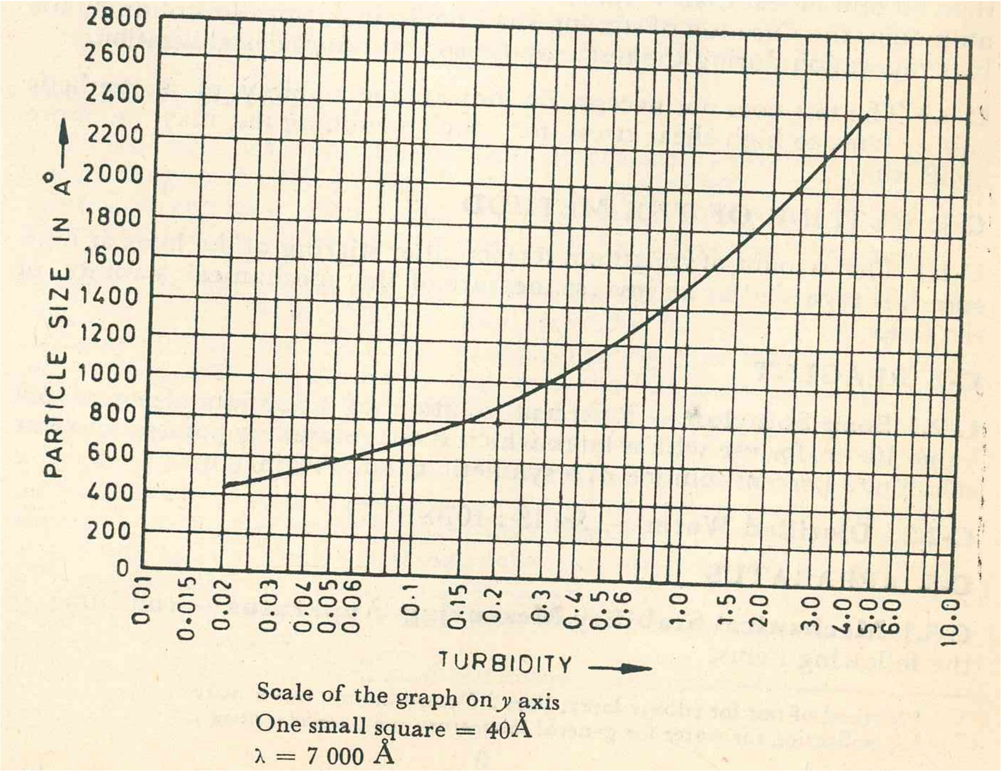
Determine absorbance at 700 nm using distilled water as blank. If absorbance does not fall between 0.07 and 0.10, different dilutions must be tried.

B-4 CALCULATION

$$\text{Turbidity} = \frac{\textit{Absorbance}}{\text{g}/1000}$$

$$= \frac{\text{Absorbance} \times 1000}{\text{Sample mass} \times \dfrac{\text{percentage total solids}}{100} \times \text{Volume of aliquot}}$$

B-4.1 Read particle size of latex in Å from the graph of turbidity *versus* particle size using Fig. 1.



Scale of the graph on y axis
One small square = 40Å
λ = 7 000 Å

FIG. 1 LOW SOLIDS LATICES (BELOW 50 PERCENT TOTAL SOLIDS)

ANNEX C

[*Table* 1, *Sl No.* (x)]

DETERMINATION OF MECHANICAL STABILITY

C-0 GENERAL

C-0.1 The test method given below specifies for the determination of the high-speed mechanical stability of synthetic rubber latex. The test is applicable to synthetic rubber latices which have a viscosity, determined with the *L* instrument in accordance with IS 9316 (Part 2) of up to 200 mPa s (200 cP). Latices of higher viscosity shall be tested after dilution to a viscosity of 200 mPa.s (200 cP) or less, provided that such dilution does not reduce the concentration of the latex by more than 10 percent total solids.

NOTE — Dilution of the latex decreases its stability because the balance of free and absorbed soap is changed.

C-0.2 The duration of stirring shall be so selected that the latex does not increase in temperature to more than 60°C and does not exceed a height of 100 mm in the latex container. The duration of stirring shall be as agreed to between the purchaser and the supplier and shall not be longer than 30 min or less than 1 min. In the case of a latex which contains ammonia, the duration of stirring shall be limited, since loss of ammonia by evaporation during the test may cause additional destabilization.

C-0.3 The test does not necessarily indicate the stability of a synthetic rubber latex to high shear stress, for which a rubbing test may be more applicable.

C-1 OUTLINE OF THE METHOD

The amount of coagulum formed after stirring of the latex at high speed, is regarded as an inverse measure of the mechanical stability of the latex.

C-2 REAGENT

C-2.1 Soap Solution

5 percent solution of potassium oleate of *p*H value 10, or, for use with a latex which is coagulated by potassium oleate solution, 5 percent solution of a synthetic anionic surfactant.

C-2.2 Distilled Water, *see* IS 1070.

C-3 APPARATUS

C-3.1 Mechanical Stability Measuring Apparatus, consisting of the following items.

C-3.1.1 *Latex Container,* flat bottomed cylindrical, at least 100 mm high, with an internal diameter of 58 ± 2 mm. The inner surface shall be smooth, and a glass container is preferred.

C-3.1.2 *Stirring Apparatus,* consisting of a vertical stainless steel shaft of sufficient length to reach to the bottom of the latex container (**C-3.1.1**) and tapering to 6.35 mm diameter at its lower end, where is attached a horizontal, smooth, stainless steel disk 36.12 ± 0.03 mm in diameter and 1.58 ± 0.05 mm thick by means of a threaded stud at the exact centre of the disk. The apparatus shall maintain a stirring speed of 14 000 ± 200 rev/ min throughout the test, at which speed the shaft shall not run out of true by more than 0.25 mm.

C-3.1.3 *Holder,* for the latex container (**C-3.1.1**). The holding arrangement shall ensure that the axis of the rotating shaft is concentric with that of the latex container and that the bottom of the stirring disk is 13 ± 2 mm from the inner surface of the bottom of the latex container.

C-3.2 Preliminary Filter, of stainless steel wire cloth with an average aperture width of 180 ± 15 µm.

C-3.3 Test Filter, consisting of a disk of stainless steel wire cloth with an average aperture width of 180 ± 15 µm, dried to constant mass and weighed to the nearest 1 mg, firmly clamped between two stainless steel rings of equal internal diameter between 25 and 50 mm.

C-4 PROCEDURE

C-4.1 In case viscosity of the latex determined with the *L* instrument [according to IS 9316 (Part 2)] exceeds 200 mPa.s (200 CP), dilute it to this or a lower value, with an amount of water which reduces the concentration of the latex by not more than 10 percent total solids.

C-4.2 Adjust the temperature of the latex to 25 ± 3ºC, pass it through the preliminary filter (**C-3.2**) and transfer 50 ± 0.5 g to the latex container. Place the container (**C-3.1.1**) in position and stir the latex at 14 000 ± 200 rev/ min for 30 min, such that the latex does not increase in temperature to more than 60°C and does not exceed a height of 100 mm in the container. If it is necessary to limit foaming, a paste of a silicone defoamer shall be smeared around the upper portion of the inner surface of the container. Immediately after the termination of stirring, remove the latex container and wash the stirrer shaft and disk free from latex deposits with soap solution. Wet the test filter (**C-3.3**) with soap solution and pour the latex and washings into the test filter. Use soap solution to ensure quantitative transfer of all latex and deposits including skin. Wash the residue on the test filter with soap solution until it is free from latex and then with water until the washings are neutral to litmus. Carefully remove the test filter containing the wet solid matter and swab the underside with filter paper. Dry the test filter and coagulum at 100 ± 2°C until the change in mass is less than 1 mg during 15 min drying.

C-5 EXPRESSION OF RESULTS

The high-speed mechanical stability of the latex shall be reported as the percentage of coagulum which is formed. Calculate it as a percentage by mass of the latex, using the formula:

$$\text{Coagulum, percent by mass} = \frac{M_1 \times 100}{M_0}$$

Where,

M_o = mass in g, of the test portion; and

M_1 = mass in g, of coagulum.

ANNEX D

(*Clause* 5)

SCALE OF SAMPLING AND CRITERIA FOR CONFORMITY

D-1 TANK SUPPLIES

D-1.1 When the material is supplied in tanks or other bulk containers, each tank or bulk container shall be sampled separately.

D-1.2 A representative sample shall be drawn from each tank of bulk container according to IS 9316 (Part 5).

D-1.3 The sample shall be tested for all the requirements given in Table 1. The material in tank or bulk container shall be considered as conforming to this specification if the corresponding representative sample satisfies all the requirements given in the specification.

D-2 DRUM SUPPLIES

D-2.1 Lot

All the drums, in a single consignment, of the same size and belonging to same batch of manufacture shall constitute a lot.

D-2.2 For ascertaining the conformity of material to the requirements of this specification samples shall be tested from each lot separately.

D-2.3 The number of drums (*n*) to be selected for sampling shall depend on size of the lot (*N*) and shall be in accordance with co1umn 1 and 2 of Table 2.

D-2.4 These drums shall be chosen at random from the lot. In order to ensure the randomness of selection, reference may be made to IS 4905. In case this standard is not readily available, following procedure may be adopted:

> Starting from any drum in the lot, count them as 1, 2, 3 . . . up to *r* and so on in one order, where r is the integral part of *N*/*n* every r^{th} drum thus counted shall be withdrawn to constitute the required sample size.

Table 2 Scale of Sampling

(*Clause* D-2.3)

Lot Size (*N*) (1)	No of Drums To Be Selected (*n*) (2)
Up to 25	3
26 to 50	5
51 to 100	7
101 and above	10

D-3 METHOD FOR TAKING SAMPLES FROM SELECTED DRUMS

From each of the drums selected according to **D-2.3**, a representative sample shall be drawn in accordance with the procedure prescribed in IS 9316 (Part 5).

D-4 TEST SAMPLE AND REFEREE SAMPLE

D-4.1 From the samples (*see* **D-3.1**) representing different drums in the lot a small but approximately equal quantity of material shall be taken and thoroughly mixed to form a composite sample, not less than 600 g. The composite sample so obtained shall be divided into three equal parts, one for the purchaser, another for the supplier and third for the referee.

D-4.2 The remaining portions of the material in the samples (*see* **D-3.1**) shall be divided into three equal parts, each forming an individual sample. One set of individual samples representing the containers selected (*n*) shall be for the purchaser, another for the supplier and third for the referee.

D-4.3 All the individual and composite samples shall be transferred to separate containers. Each container shall then be sealed air-tight with stoppers and marked with full details of sampling, the date of sampling, year of manufacture, batch or code number and other important particulars of the consignment.

D-4.4 The referee sample consisting of a composite sample and a set of individual samples shal1 bear the seals of both the purchaser and the supplier and shall be kept at a place agreed to between the two. This shall be used in case of any dispute between the two.

D-5 NUMBER OF TESTS

D-5.1 Tests for determination of total solid content shall be conducted on each of the individual samples.

D-5.2 Tests for remaining characteristics shall be carried out on the composite sample.

D-6 CRITERIA FOR CONFORMITY

D-6.1 The lot shall be declared as conforming to the requirements of the specification if **D-6.1.1** and **D-6.1.2** are satisfied.

D-6.1.1 The test results on each of the individual samples for total solid content, satisfy the corresponding specification requirements given in Table 1.

D-6.1.2 For remaining characteristics given in Table results on the composite sample meet the corresponding requirements given in Table 1.

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Rubber and Rubber Products Sectional Committee, PCD 13

Organization	*Representative(s)*
The Rubber Board, Kottayam	Dr James Jacob (***Chairman***) Dr Siby Varghese (*Alternate*)
Dow Corning India Pvt Ltd, Haryana	Shri Subhranshu Gupta
Export Inspection Council of India, Delhi	Shri K. J. Srivastav
Flame Retardants Association of India, Gurgaon	Shri P. V. Murali Mohan
GRP Limited, Mumbai	Shri Kalyan Das
Hasetri, Rajasthan	Shri Saikat Das Gupta
Hindustan Latex Lifecare Limited, Noida	Dr. A. G. Shankaran
In Personal Capacity	Dr Arup K. Chandra
In Personal Capacity	Dr Sunny Sebastian
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Ka Pre Vulcanized Tamil Nadu	Shri Praveen Mathew (Director)
LPG Equipment Research Centre, Bangalore	Shri A. Krishna Kutty Shri K. K. Thakur (*Alternate*)
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Personal Capacity	Dr Ranjit Mathhan
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Research, Designs & Standards Organization, Lucknow	Shri Mnjesh Kumar Shri Ravi Prakash (*Alternate*)

Organization	*Representative(s)*
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Member Secretary

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Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: PCD 13 (14696).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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Published by BIS, New Delhi